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ABSTRACT

Persons from the field of science education and persons who had extensive experience working with visually handicapped children were brought together to establish some baselines and beginning ideas of approaches to the evaluation of a laboratory - centered science program (Science Curriculum Improvement Study) as it is being used with visually handicapped children. Areas in which participants were in agreement relative to evaluation in the project were: (1) The evaluation approach needs to be individualized in all ways and should attempt to assess the changes in specific pupils; (2) The evaluation system and approach will have to be original since little has been done in the evaluation of the science learnings of "blind" children; (3) Evaluation has to be continuing and related to the individuals in a given class or program at a given time; (4) Children's skill in using tools should be evaluated; (5) Considerable emphasis was given to the value of expert observers as a means of evaluation of program success; (6) Concern was also expressed for finding ways to assess the effect of the program on the individual's value system and general orientation towards science as indicated by his feelings regarding environmental pollution and other major problems in society. This work was prepared under ESEA Title III contract. (BR)

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ADAPTING SCIENCE MATERIALS FOR THE BLIND

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Report of an
Evaluation Planning Conference
Lawrence Hall of Science
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Introduction

Evaluation of the learning experiences of young children is a difficult task. Especially in science, the verbal limitations of the children and their developmental inability to handle abstractions makes extremely difficult the design of meaningful assessment procedures.

All of these difficulties and limitations are significantly increased when one turns the focus of their attention to the "blind" (see Note) child. As a group, these children have had fewer real experiences and are operationally retarded in language development and the ability to put thoughts and experiences together. A search of the literature revealed little in relation to evaluation of science learnings for "blind" children; and as a matter of fact, little that related to any aspect of a science program for blind elementary school children. For these reasons it was decided that it would be valuable early in the project (start of the fourth month) to hold a conference on evaluation planning. The reason for the conference as stated in the letter of invitation was:

"The purpose of the conference is to bring together individuals

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Note: For purposes of this report and the project as a whole, "blind" is taken to mean any child with a visual handicap severe enough to warrant special educational placement either in a regular school or a specialized school for the blind.

A COOPERATIVE PROJECT OF THE
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from the field of science education with those who have had extensive experience working with visually handicapped children. Hopefully, by causing both groups to interact with the staff of our project, we will establish some baselines and also beginning ideas of approaches to the evaluation of a laboratory-centered science program as it is being used with visually handicapped children."

Fifteen of the sixteen people invited attended the half-day conference. A list of the participants and their affiliations is included at the end of this report.

Organization of the Conference

The conference opened with a short description of, and introduction to the life and physical science program of the Science Curriculum Improvement Study. This was necessary since the work of this project will be based on the SCIS units. Next came a presentation of some of the early adaptations designed by the project staff and the results of the trials of some of these in the classroom. A short videotape of one of the teaching sessions at the California State School for the Blind was shown. This introduction of the program served to orient the participants to the purposes of the project and its mode of operation. The evaluation needs of the project were then briefly discussed by the group as a whole. The addendum giving the revised statement of Project Objectives and Evaluation Plans was distributed to each participant.

The group then broke up into three subgroups so structured that each one included a cross section of the skills and experience possessed by the individuals at the conference. The groups, each under the leadership of a project staff member, met for about 1-1/2 hours to consider the topic of the conference and try to formulate specific evaluation plans. A free interchange of ideas was encouraged and no formal presentations were made in any of the subgroup sessions.

Each subgroup then reported its findings to the group as a whole and a discussion was held relative to the findings of the subgroups and the further ideas of the conference participants.

Outcomes of the Conference

The major suggestions and ideas resulting from the conference are included in the reports of the three subgroups. Each of these reports and a summary of the major points brought up in the final session follow:

Report of Subgroup 1

Members of this group were:

Mr. Carl Berger, Chairman and reporter
Dr. Phillip Hatlen
Dr. Paul Hurd
Dr. Everett Wilcox

The objective of the subcommittee was to develop new approaches to the problem of evaluation, particularly the problem of developing baselines for evaluation of visually handicapped children. That is, develop kinds of measures relative to the capabilities of the children that will enable us to know where the children are at the onset of the program.

A first single approach suggested was the measure of hand skills. Because of the large number of items of science materials, a simple check list on the children's ability to manipulate the objects could be easily devised. After a suitable period of time this could be checked again and gains could be recorded.

The sample of legally blind children that will be using the SCIS materials will be very small and has tremendous variation; thus no attempt should be made to compare groups of children. An entirely individual approach should be taken in the evaluation of blind children. For the first time, this is economically feasible because of the resource teacher available to work with blind children.

Thus we must develop a position paper for evaluation based on the individual child. Each part of the evaulation should be based on where the child is at entry, then develop some measure to determine the success he is having with the materials. Since

each child is measured against himself, he would be measured on his own scale, not on a group scale. From this position, two very ingenious measures emerged: 1) the field trip measure; and 2) the description measure.

The field trip. Video tape children on a field trip and use this as baseline. Tape a one-minute session of each student. After the program, retape and find what observing tools sufficiently different the children are using; also if they are using concepts from the classroom in a context out of the classroom.

The second measure, description. Give each child the same object and record his description of the object after asking, "Tell me about this object". Then after working with the materials, have him describe the object again. Record and tally the number of terms used, and types of terms. Find the shift in terms from function and similarity to property and material.

Blind children, possibly more than any other, have had limited environmental experience. Thus, some may enter the SCIS program with the knowledge of fewer ranges of materials than other children. Baseline evaluation can determine the readiness for SCIS and, if necessary, be used as guidelines to determine an SCIS readiness program.

Two different baselines should be established; one dealing with verbal description and the other, a measure of the non-verbal science behavior. Non-verbal ability can be generated along the lines of those devised by Larry Hateman and Phil Yocum in their work on "orientation mobility". That is the ability to follow a set of sequenced directions. In this respect, blind children may be ahead of sighted children because they are quite aware of the terms, "right", "left", etc.

We should not concern ourselves with any particular organism if microscopic, but achieve the same concept through another non-microscopic organism. Thus the parallel organism could be used in evaluation of the concept as gained by the sighted children.

The evaluation should take a quite different track. One approach would be a "success evaluation" approach. In success evaluation, the children's evaluation can be viewed as feedback and optional activities continue until each individual child succeeds. Thus, the evaluation of the project would be successful because each child will have succeeded. Some children may have taken longer than others, but all will have been successful.

Hawkins at the Elementary Science Center at University of Colorado, has done some interesting work on evaluation of deaf children and the report would be quite helpful to us.

Report of Subgroup 2

Members of this group were:

Mr. Robert Knott, Chairman and reporter
Dr. Carson Nolan
Dr. Don Lundstrom,
Dr. Robert Karplus
Mr. Ross Huckins

After a short discussion of available evaluative instruments for severely visually handicapped persons, we decided there were no standardized tests we could use to measure the kinds of process and content improvements we expect with these children. The BLAT (Blind Learning Aptitude Test) is the only test we know which may be useful.

Four classes of people were identified as possible sources for our evaluation:

1. The classroom teacher and teachers of other subjects.
2. The child.
3. The parent, counselor or relative with whom the student resides.
4. The resource teacher.

Our concensus was that the evaluation of the child's development in scientific abilities and literacy should include subjective measurements made outside the classroom as well as those made in the science classroom setting.

Some specific skills we would measure include the following:

1. The increased use of tactile discrimination to investigate new materials.
   a. Measure the speed with which a child uses tactile methods to "observe".
   b. Measure the time he spends on tactile discrimination.
   c. Measure the detail threshold he reaches before he quits.
2. The quality of tactile discriminations.
   a. Measure how well he can duplicate an object by making a molding clay copy.
   b. Measure the quality of his description of objects.
   c. Measure the improvement in his ability to handle or assemble objects and equipment.
3. The motor improvement including the increased diversity of his manipulations evidenced as he explores new objects.
4. The child's improvement in problem recognition.
5. The child's willingness to try to solve a problem.
6. The quality of the child's attempts to solve problems.
7. The length of time a child spends on science irrespective of demand.
8. Tool-using ability.
9. The changes in children's abilities and willingness to manipulate and change situations so they can isolate the factors responsible for the phenomenon.
10. The child's ability to study a board with various shaped holes at one time; study various shaped blocks at a separate time; then to decide which objects go into which hole when he works with both the blocks and the board.
11. The number of attacks a child makes on a problem before and after his science course.

Some measurements of the child's content achievement are:

1. Personal questioning by the resource teacher.
2. Classroom contributions.
   a. Quantity.
   b. Quality.

3. Spontaneous use of words and concepts.
4. How specific the children are in their descriptions of objects, relationships, and phenomena.
5. Vocabulary development.
6. Identification of system parts impressed on pages as those from the system with which they have been working.

Some measurements of the child's relationships with others are:

1. The change in acceptance of the blind child by sighted children during science as compared to non-science courses.
2. The changes in self-esteem evidenced by the blind child pre and post science course.

Some general comments.

1. Keep the evaluation simple
2. Utilize video tapes and a panel of judges.
3. Use college students to collect data.
4. Teachers should be trained (by resource teachers) how to evaluate children's use of their hands.

Report of Subgroup 3

Members of this group were:

Dr. Herbert Thier, Chairman
Dr. Berthold Lowenfeld, Reporter
Dr. Lawrence Lowery
Mr. David Passarell
Mr. Fred Sinclair

The group's assignment was described as the consideration of what should be included in the design of an evaluation program for the project. That is, how does one measure or assess changes in children who have had the program.

A number of important guidelines were suggested by members of the group, and these are listed below:

1. Evaluate performance of the individual child in carrying out

the program activities. Growth in the individual child's capability to manipulate materials is evidence of success.

2. There is a great need for "concreteness" when working with blind children. Use objects that are within the range of the child's experience. Concepts must be recognized and understood before symbols are used. Items used should be within the "touch space" of the children.

3. Evaluation should be organized to provide evidence of understanding, not just correct numerical answers. Evaluation should take place during the activity and should be open ended.

4. Blind children start from ground O and usually they have had little prior experience in science.

5. In the public school situation where the majority of the children are; the "resource teacher" is available to do the evaluation. Therefore, the evaluation can be individualized and open ended. Emphasis was placed on the idea of assessment of individual accomplishments rather than achievement of an arbitrary standard.

6. Vocabulary and its meaningful application will be important in evaluation. First you will measure the child's ability to use language to describe and explain what happened both verbally and in writing.

7. Important to realize, you will receive different levels of responses at different age and experience levels. Cannot assume blind children of a certain age have had usual experiences for children of that age.

8. In first and second grade, no baselines are necessary as you can assume the child starts from a lack of experience. From then on, experiences and understanding of early (1st and 2nd grade) program form the baselines for the upper grade programs. Alternately, assess status of child's experience in science before beginning his first unit. Afterwards, post unit measures for previous unit form baselines for new unit. Continue to emphasize assessment of individual growth.

9. Baselines for sighted children are not applicable to blind children. Blind children tend to be experientially deprived children. A blind child starts behind the sighted child of the same age, but provided a meaningful program, will show a reasonable rate of growth in knowledge and understanding.

Summary of the Final Session

During the final session, many ideas and points of view relative to evaluation in this project and evaluation in general were brought up. Considerable time was spent discussing the values of, and differences between "behavioristic" and "naturalistic" evaluation. In spite of significant differences in approach to evaluation by a number of the participants, there were a number of areas in which there was agreement relative to the question of evaluation in the project. These are:

1. The evaluation approach needs to be individualized in all ways and should attempt to assess the changes in specific pupils.

2. The evaluation system and approach will have to be original since little has been done in the evaluation of the science learnings of "blind" children.

3. Any materials developed will be used by a group of children with very diverse backgrounds and experiences. For these reasons, evaluation has to be continuing and related to the individuals in a given class or program at a given time.

4. Children's skill in using tools should be evaluated. An example is their ability to measure a seedling using a brailled ruler.

5. Considerable emphasis was given to the value of expert observers as a means of evaluation of program success. Also such things as continued use of the program and parental and other outside opinion, were mentioned as evaluation evidence.

6. Concern was also expressed for finding ways to assess the effect of the program on the individual's value system and general orientation towards science as indicated by his feelings regarding environmental pollution and other major problems in society.

Dr. Carson Y. Nolan, Director, Department of Educational Research, American Printing House for the Blind, was a participant in the conference and special consultant to the project for two days. He made the following general comments about the project as a whole, and evaluation in particular during his visit:

1. He was delighted with the timeliness of the project. Usually materials for the blind lag developments in the instructional field by

a considerable number of years. In this case, development of the adapted program is taking place during the period of development of the regular program.

2. He felt giving the children first-hand experiences with the materials is a very valuable part of the program. He and others felt these actual experiences are most important for "blind" children.

3. During work on the adaptations keep in mind that the market is very small numerically and, therefore, the cost of any special items which need developing tends to be high. For this reason, one should try to use already available (from the regular program kits) materials whenever possible.

4. In relation to evaluation, Dr. Nolan described it as a formidable problem of equal magnitude to the curriculum adaptation work. He made a plea for keeping the evaluation simple and, as an example, suggested simply counting the occurrence of various events in different categories rather than trying to design complex statistical measurements.

Summary and Conclusions

The conference proved to be a most valuable experience for the members of the project staff. From the discussions emerged the feeling that the evaluation plans as described in the attached addendum are on the right track, but may represent somewhat more than what can be accomplished during the first year. An attitude of tentativeness and willingness to try out alternate approaches is needed. The project realizes that in assessing the science learning of young "blind" children, they are moving into an area in which little or no previous work has been done.

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